ANALYST:		VPDES NO.	

Parameter: Biochemical Oxygen Demand
Method: Dissolved Oxygen Depletion
1/08

METHOD OF ANALYSIS:

	18th Edition of Standard Methods 5210 B
	21st or On-Line Edition of Standard Methods 5210 B (01)

	BOD is a method-defined analyte so modifications are not allowed. [40 CFR Part 136.6]	**Y**	**N**
1)	Is a certificate of operator competence or initial demonstration of capability available for each analyst/operator performing this analysis? **NOTE:** Analyze 4 samples of known BOD concentration with each sample having +/- 20 % recovery. [SM 1020 B.1]		
2)	Are incubation bottles cleaned well with detergent, rinsed thoroughly, and drained before use? **NOTE:** Do not use anything to clean bottles that will inhibit growth of seed material such as bleach or chromic acid. [2.a]		
3)	Are nutrient solutions (calcium chloride, magnesium sulfate, ferric chloride, and phosphate buffer) free of biological growths and solids, and within shelf lives? [3]		
4)	Is the phosphate buffer solution documented to be at pH 7.2 when prepared? [3.a]		
5)	Are all nutrient solutions added at a rate of 1 mL/L to dilution water? **NOTE:** Hach slurry pillows are acceptable. [18th ed. 4.a; 21st ed. 5.a]		
6)	Is dilution water free of contamination or growths? [3.a]		
7)	Are chlorinated samples checked for chlorine using an appropriate method? **NOTE:** The chlorine check must be documented. [18th ed. 4.e.2; 21st ed. 4.b.2]		
8)	Are samples containing residual chlorine, dechlorinated with sodium sulfite? [18th ed. 4.e.2; 21st ed. 4.b.2]		
9)	Is sodium sulfite dechlorinating solution prepared fresh daily? Documentation needed. [3.f]		
10)	Are samples checked for caustic alkalinity or acidity? (pH <6.0 or >8.0 SU) [18th ed. 4.e.1; 21st ed. 4.b.1]		
11)	Are samples containing acidity or caustic alkalinity adjusted to fall between pH 6.5 and 7.5 for 18th ed. and 7.0 and 7.2 for 21st ed.? [18th ed. 4.e.2; 21st ed. 4.b.2]		
12)	If the initial DO exceeds saturation at 20°C, is sample stripped of excess DO by agitation or aeration? [18th ed. 4.e.4; 21st ed. 4.b.4]		
13)	Are sample initial dissolved oxygen concentrations between 7 mg/L and saturation? [18th ed. 6.b; 21st ed. 8.b]		
14)	Are samples allowed to reach 20 ± 1°C (18th ed.) or 20 ± 3°C (21st ed.) before making dilutions? **NOTE:** Documentation is necessary. [18th ed. 4.e.5; 21st ed. 5.b]		
15)	Is dilution water saturated with dissolved oxygen at 20°C before use? [18th ed. 4.a; 21st ed. 5.a]		
16)	If seeding is necessary for samples being analyzed is appropriate seed material used? [18th ed. 4.d.1; 21st ed. 5.d]		
17)	Is a seed control series run for seeded samples? [18th ed. 4.d.2; 21st ed. 6.d]		

		Y	N
18)	For seeded samples, is the calculated seed correction between 0.6 and 1.0 mg/L? [18th ed. 4.d.2; 21st ed. 5.d]		
19)	If $CBOD_5$ is analyzed, are dilutions and seed correction series inhibited with 2.2% 2-chloro 6-trichloro-methyl pyridine (HACH nitrification inhibitor 2533 or equivalent)? **NOTE:** Polyseed-NX is not approved for use in VPDES testing. Do not add inhibitor to GGA. (For exception see question 36.) A separate seed correction series without inhibitor must also be analyzed so that GGA can be properly calculated. [18th ed. 4.e.6; 21st ed. 5.e.1]		
20)	Are samples prepared without entraining air in BOD bottles? [18th ed. 4.f.2; 21st ed. 5.c.1]		
21)	Are dissolved oxygen concentrations measured correctly (see Winkler/Azide, LDO, or DO electrode Checklists)? [18th ed. 4.e.6; 21st ed. 5.g]		
22)	Are water seals maintained? [18th ed. 4.f.2; 21st ed. 5.f]		
23)	Are samples incubated in the dark at 20 ± 1°C for 5 days? **NOTE:** Documentation is necessary. [18th ed. 4.f.2; 21st ed. 5.h]		
24)	Is the final DO of at least one dilution at least 1 mg/L after 5 days? [18th ed. 5; 21st ed. 6.a]		
25)	Is the DO depletion of at least one dilution at least 2 mg/L after 5 days? (Disregard if sample is not diluted) [18th ed. 4.f; 21st ed. 6.a]		
26)	Are all bottles meeting the depletion criteria averaged for final BOD results? [18th ed. 5; 21st ed. 7]		
27)	Is a dilution water blank run for each test series and are blank depletions recorded on bench sheets? [18th ed. 4.h; 21st ed. 6.c]		
28)	Is the dilution water blank DO depletion consistently less than 0.4 mg/L (DEQ criterion)? [18th ed. 4.h; 21st ed. 6.c]		
29)	Are dilutions capable of demonstrating permit excursions? [18th ed. 4.f; 21st ed. 5.c]		
30)	Are at least three dilutions analyzed for each sample? [18th ed. 4.f; 21st ed. 5.c]		
31)	Are sample results calculated correctly? [18th ed. 5; 21st ed. 7.c] $BOD\ (mg/L) = \frac{(D1 - D2) - (B1 - B2)f}{P}$ where D1 = D.O. of diluted sample after preparation D2 = D.O. of diluted sample after 5 days P = decimal volumetric fraction of sample B1 = D.O. of seed control before incubation B2 = D.O. of seed control after incubation f = ratio of seed in sample to seed in control (% seed in D1)/(% seed in B1)		
32)	Are BOD bottles (blank/seed/sample/GGA) chosen at random? [Permit]		
33)	Is the glucose-glutamic acid (GGA) check run at least once each week of analysis? [18th ed. 4.c; 21st ed. 6.b]		
34)	Is the GGA prepared immediately before use? [3.h]		
35)	Is the BOD_5 of the 2% dilution of the GGA standard within the range of 198 ± 30.5 mg/L? **NOTE:** 21st ed. requires set up of three test bottles and the average result be within range. [18th ed. 6; 21st ed. 6.b]		
36)	If citing the 21st ed. is nitrification inhibitor added to GGA test bottles if seed is obtained from a source that is nitrifying? [21st ed. 6.b]		
37)	Is data flagged on benchsheet and DMR when QC problems occur (e.g., GGA out of range, blank >0.4 mg/L, bubbles in bottle at end of incubations)? [Permit & 21st ed. 7.b]		

		Y	N
38)	Is raw data evaluated to determine if toxicity is present? [18th ed. 5; 21st ed. 7.b]		
39)	If toxicity is present, are BOD results reported properly? [18th ed. 6; 21st ed. 6.b]		
40)	Is a duplicate sample analyzed after every 20 samples if citing 18th ed. [1020 B.6] or weekly for 21st ed. [2540 D.3.c]? **NOTE:** "Duplicate sample" must have same dilutions as "sample".		
41)	If duplicate sample is analyzed, is the relative percent difference (RPD) ≤ 20? [18th ed. Table 1020 I; 21st ed. DEQ]		
42)	Is a laboratory control sample (LCS) analyzed at the required frequency? [18th ed. 1020 B. 3; 21st ed. 11020 C.1]		

PROBLEMS: